Ecloud modeling update

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Presented to:
Electron modeling group
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* Work performed for the U.S. DOE under contracts W7405-ENG-48 at U.C. LLNL and DE-AC03-76F00098 at U.C. LBNL

Tested 3 options for moving electrons

- Full orbits, resolved cyclotron motion
  - dt = 0.25 * min cyclotron period
- Full mover but with dt = 10 times above, with leap-frog v and t (the Parker scheme)
  - My previously reported test was unfair: had warp's allspecl =1 option turned on, so v was synchronous with x. For large dt such a scheme will NOT get correct drifts for the cases Parker considered
- Interpolation scheme I suggested in APS poseter (reviewed on next slide)
- Results:
  - For very low-initial energy particles all three schemes do well; cyclotron orbits are very small.
  - For more energetic particles -- e.g. 400 ev partcles turning at 1 cm radius in hcx-like magnets, and modest beam space charge potential (corresp to 0.25 A beam) there are significant differences; the interpolation scheme does much better than Parker scheme

Interpolation scheme

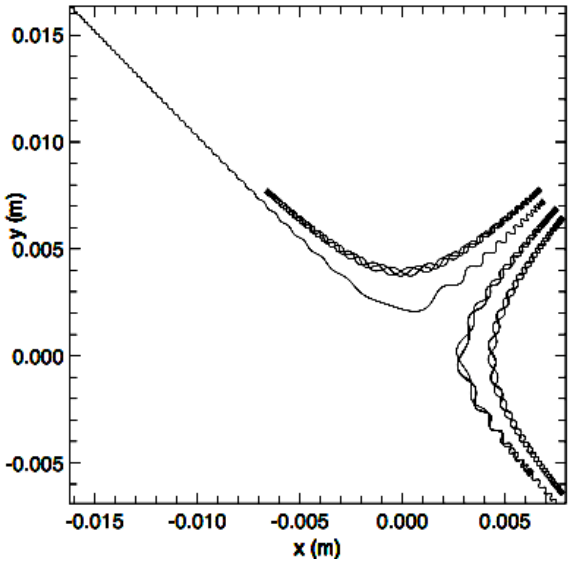
- Update full instantaneous particle velocity v_L.
- Calculate drift (ExB + magnetic) velocity v_d
- Interpolate

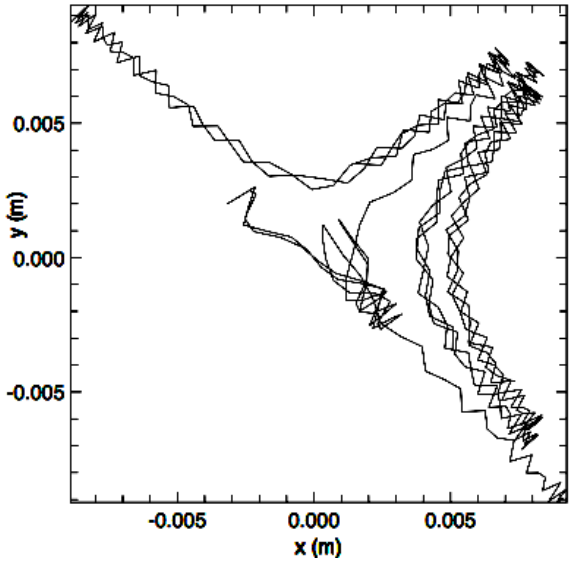
  $\mathbf{v}_{eff} = \alpha \mathbf{v}_{L\perp} + (1-\alpha)\,\mathbf{v}_d + \mathbf{v}_{||}$
- Update **x** with v_{eff}
- Interpolation function α: my choice

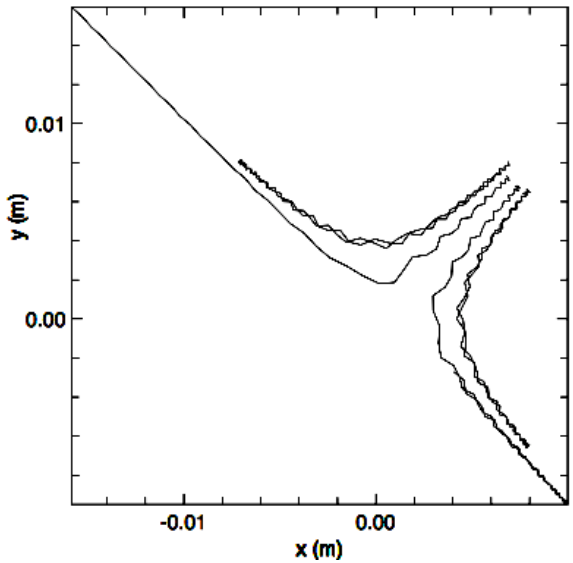
  $\alpha = 1/[1+ 0.25(\omega_{ci}\, dt)^2]^{1/2}$

  yields physical gyroradius at large as well as small dt
- Correct drifts for the cases analyzed by Parker

x vs y





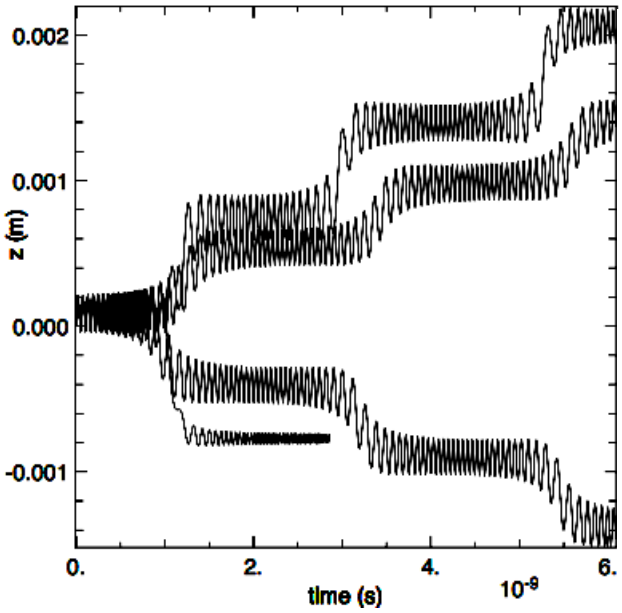


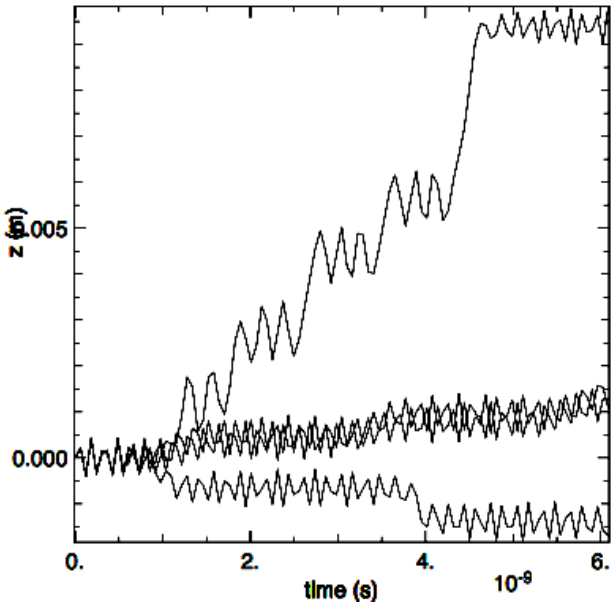
Full

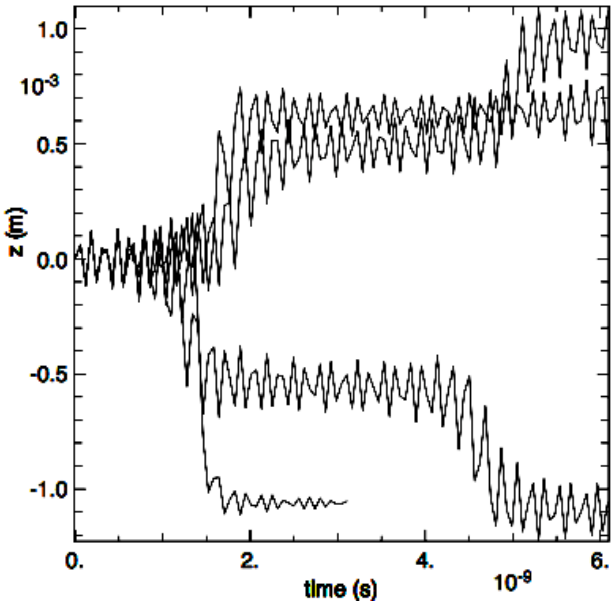
"Parker"

Interp.

z vs t







Full

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